

The social-emotional functioning of young children with a significant cognitive and motor developmental delay

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Children with a significant cognitive and motor developmental delay (SDD) are vulnerable for the development of (future) behavioral and mental health problems. This paper aims to assess the social-emotional functioning of these children, both globally and in various domains. Semi-structured interviews with one or more primary caregiver(s) of 45 children were conducted and analyzed on 13 domains of social-emotional functioning, according to the Scale for Emotional Development - Revised (SED-R). The SED-R scoring system was slightly adapted in the current study in order to elucidate more subtle differences between children. A general delayed social-emotional development was found, with children functioning within different phases across domains and certain domains generally showing higher or lower scores. To capture the emotional needs of children with SDD, a more disaggregated scoring system seems valuable so that both the global level and the level per domain can be taken in consideration in designing interventions.

Keywords: social-emotional development, social-emotional functioning, SED-R, PIMD, profound ID, multiple disabilities, young children with a significant cognitive and motor developmental delay, interviews

Introduction

Children's social-emotional skills at early ages are predictive for their adaptive functioning and mental well-being (Cassidy 2016, Mikulincer *et al.* 2003). These early social-emotional skills encompass a variety of different themes: basic emotions (such as happiness, fear, anger, and sadness), other emotional reactions (such as interest, surprise, preferences, and disgust), emotional self-regulation, attachment, social referencing behavior, self-conscious emotions (such as guilt, embarrassment, shame, envy, and pride), feelings of sympathy and empathy, peer sociability, interaction and play behavior, and feelings of gender identity (Berk 2010, Bukatko and Daehler 2004, Campbell *et al.* 2016). The development of social-emotional skills starts very early in life, is strongly influenced by parent-child interactions, and expands during interactions and relationships with other family members, peers, and significant adults (Bowlby 1969/1982, Malatesta *et al.* 1989, Sanders and Morawska 2018, Shaffer and Kipp 2002). In addition, the children's temperament, which is the "early

appealing and relatively stable individual differences in reactivity and self-regulation" also plays an important role in the way children react to situations and in the interactions they have with caretakers and peers (Berk 2010, p. 190; Rothbart and Bates 2006).

Research regarding the children's social-emotional functioning was initiated by several pioneers. Erikson defined eight stages in the social and emotional development (Erikson 1950, Rosenthal *et al.* 1981). Bowlby (e.g. 1969) and Ainsworth (Ainsworth *et al.* 1978) described the development of attachment behavior, separation and stranger anxiety. Chess and Thomas (1991) and Rothbart (Rothbart and Bates 2006, Zentner and Bates 2008) demonstrated the impact of the child's temperament. This research continued during the last decades (e.g. Barrett *et al.* 2016, Bennett *et al.* 2005, Fagot 1997, Wörmann *et al.* 2012). Based on that extensive research base from various perspectives, critical and sensitive moments and periods in the development of social and emotional skills were distinguished, and stimulating and hampering factors were identified (Bornstein 2019, Case-Smith 2013, Waters and Cummings 2000).

During the last decades, the social and emotional development has also become a key concept within the treatment and support of people with an intellectual disability and

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Table 1. Five-stage model of emotional development for children from 0 to 12 years of age (Došen 1990).

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
0-6 months Adaptation Psycho-physiological homeostasis Integration of sensory stimuli, integration of structure of time, place and persons	6-18 months First socialization Secure attachment, bonding, secure emotional base	18-36 months Individuation Self-other differentiation Objective-self, separation, autonomy	3-7 year Identification Ego-forming (impulsive ego)	7-12 years Reality awareness Ego-differentiation (moral ego)

challenging behavior (Claes *et al.* 2011, de Bruijn *et al.* 2016). Došen (1990, 2005) considers behavioral problems as the result of a discrepant profile of the cognitive versus the social-emotional development. Determining the social-emotional needs of the person with an intellectual disability is necessary to realize an approach and an environment that meets these needs and prevents or diminishes behavioral problems. Došen (1990, 2005) presented a dynamic developmental approach of the social-emotional development. In this approach, the social-emotional development of typically developing children can be divided into five phases (see Table 1), i.e. the adaptation phase (0-6 months), the first socialization phase (6-18 months), the first individuation phase (18-36 months), the identification phase (3-7 years), and the phase of reality awareness (7-12 years).

Currently, to the best of our knowledge, no research is available on the social-emotional functioning of the specific group of young children with a significant developmental delay (SDD) in both the cognitive and the motor domain. These children are characterized by 1) a profound intellectual disability (IQ < 20 or a developmental age below a quarter of their chronological age; Grossman 1973, Hogg *et al.* 1981, Vig and Sanders 2007) and 2) a profound motor impairment (Nakken and Vlaskamp 2007). In addition to these two core characteristics, children with SDD often suffer from medical problems and/or sensory impairments (Nakken and Vlaskamp 2007). Moreover, behavioral and mental health problems, which are often explained by limitations in emotion-regulating capacities, are much more prevalent in the group of persons with (severe) intellectual disabilities compared to persons without an intellectual disability (Schuengel and Janssen 2006). To support children with SDD on this behalf, an adequate assessment of these children's social-emotional development is necessary (Claes and Verduyn 2012).

Therefore, the main purpose of the current study was to examine the social-emotional functioning of young children with SDD, by answering the following exploratory research questions:

(1a) What is the global level of social-emotional functioning of young children with SDD?

(1b) What is the level of functioning of these children on various domains of their social-emotional functioning?

(2) How does the assessment on various domains of social-emotional functioning relate to the children's global level of functioning of social-emotional functioning?

Method

Participants

One or more primary caregiver(s)¹ of 45 young children (6-59 months) with SDD participated in this study. Detailed background information on the children and their family context is presented in Table 2. They were recruited through hospitals, diagnostic centers, early intervention teams and specialized day care centers in Flanders within the context of a broader project on child development within this target group. Professionals within these organizations were asked (by mail and/or by telephone) to inform potential participants about the study and to bring them into contact with the researchers. Children before the age of six months were not included, because clear indications of SDD had to be present and we wanted to respect the high emotional stress of parents in the first months after birth. A significant cognitive developmental delay was operationalized using the 'Tandemlijst' (Stadeus *et al.* 1994). The Tandemlijst is specifically developed in practice for young children with a developmental delay. It includes the developmental steps and milestones used in early intervention programs. By describing the cognitive developmental domain separately and in detail, the influence of the motor limitations on the estimation of cognitive functioning is minimized as much as possible. In this study children were included, who function at a cognitive developmental age below a quarter of their chronological age, which is associated with the description of a profound intellectual disability (Hogg *et al.* 1981, Vig and Sanders 2007). The Tandemlijst was solely used to estimate whether the children were meeting the inclusion criteria for the current study, but did not offer a fine-grained estimation of the children's cognitive developmental age. There is currently no information available on the psychometric properties of the Tandemlijst.

A significant motor developmental delay was operationalized using the 'Gross Motor Function Classification System – Expanded and Revised' (GMFCS-E&R; Palisano *et al.* 2007). The original GMFCS was specifically developed for and widely used in research on relatively young children with significant motor limitations and shows a good reliability and predictive value (Wood and Rosenbaum 2000), with the GMFCS and the

¹Children's primary caregivers were defined as his/her parent(s) or as a professional caregiver from the residential care organization if the child resides there on a regular basis.

Table 2. Sample characteristics.

Variables	N (%)	min.-max.	M (SD)
Children	45		
Gender			
Male	18 (40%)		
Female	27 (60%)		
Age (in months)		12-58	37.87 (10.93)
Sensory impairments			
Reduced vision	23 (51%)		
Blindness	3 (7%)		
Reduced hearing	6 (13%)		
Deafness	2 (4%)		
Health problems			
Gastro-intestinal problems	22 (49%)		
Heart problems	3 (7%)		
Respiratory problems	14 (31%)		
Epilepsy	28 (62%)		
Others	15 (33%)		
Etiology			
Genetic defect	21 (47%)		
Perinatal asphyxia	3 (7%)		
Acquired brain injury	2 (4%)		
Unknown	19 (42%)		
Parity			
Firstborn	17 (38%)		
Only child	9 (20%)		
Country of residence			
Belgium	22 (49%)		
The Netherlands	23 (51%)		
Families	42^a		
Number of family members		2-8	4.07 (1.09)
Parent(al figure)s		1-2	1.93 (0.26)
Children		1-6	2.14 (1.03)
One-parent households	3 (7%)		
Reconstituted families	3 (7%)		

^aThis information was missing for one child and not applicable for two children who exclusively lived in a care facility.

GMFCS-E&R showing an almost perfect agreement ($K=.96$; Gudmundsson and Nordmark 2013). The instrument provides descriptions of motor abilities for different age bands, including 0 to 2, 2 to 4 and 4 to 6 years. In this study children were included who function at the levels IV or V (indicating a severe impairment) and, additionally, level III when the child was less than 2 years old (since combining levels III, IV and V has a better predictive value at this young age; Gorter *et al.* 2009). Detailed inclusion criteria are available from the first author upon request. The presence of a SDD in both the cognitive and the motor domain was regarded as a necessary and sufficient inclusion criterion (in concordance with the definition of profound intellectual and multiple disabilities; Nakken and Vlaskamp 2007²). Children who only showed a significant delay in one of the two developmental domains

²A core criterion for the demarcation of the group of persons with profound intellectual and multiple disabilities (PIMD), is the presence of a profound intellectual disability (IQ below 20) or a developmental age below 2 years (Kraijer and Plas 2007, Nakken and Vlaskamp 2007). Since establishing reliable IQ-scores in young children with a significant developmental delay is extremely challenging, the measurement of intellectual functioning with standardized, individual intelligence tests is typically done in children of approximately five years or older (Weis 2014) and defining a developmental 'plateau' (i.e. developmental age below 2 years) is not useful at a very young age, we do not think it is justified to use the term 'PIMD' in this study and we opted to use the description 'significant cognitive and motor developmental delay'.

were not included. No criteria were formulated regarding the cause of the developmental delay and the presence of additional constraints (sensory disabilities, health problems, comorbid diagnoses such as autism spectrum disorder, etc.).

Instrument

The Scale for Emotional Development-Revised (Claes and Verduyn 2012) is a semi-structured interview with one or more primary caregiver(s) about the social-emotional development of a person with an intellectual disability and results in a social-emotional developmental profile of the person³. The SED-R includes 13 domains, which are defined in Table 3. For each of the 13 domains, the person's functioning is rated within one of the five phases of emotional development (cf. Table 1) through a discussion between multiple persons (in the current research, four different researchers) after which consensus is reached. The descriptions of the phases of emotional development within each domain are broadly and openly formulated in the SED-R to allow caregivers to interpret the description taking into account the specific (sensory) impairment(s) of the child. Afterwards, the SED-R allows to calculate a global score (i.e. the global level of emotional functioning) by taking the median of the 13 domain scores. The authors of the SED-R point out that this needs to be interpreted as 'the emotional development of this person is not higher than...'. Recent studies indicate that the SED-R generally shows a high internal consistency, and substantial inter-rater reliability for the total and average score of the SED-R (Vandeveldt *et al.* 2016). In addition, the SED-R internal consistency with 13 domains is high within this study, with a Cronbach's Alpha-value of 0.87.

Procedure and scoring

This study was approved by the Social and Societal Ethics Committee (KU Leuven, Belgium) and written informed consent was obtained from parents prior to data collection. Researchers (unknown to the family) conducted a SED-interview with the primary caregiver(s) of 45 children with SDD (for each child one interview was conducted). In 24 of the interviews, mothers were the sole informant (53.3%), while fathers were the sole informant in four interviews (8.9%). In nine cases (20%), both parents were interviewed. For two children (4.4%), the mother was interviewed together with a professional caregiver, while in six children (13.3%), only professional caregivers were involved in the study. The choice of the interview partners

³In 2016, a further revised version of this instrument was published (SED-R², Morisse and Došen 2016). However, at the time of the data collection of this study, this version was not yet available.

Table 3. Overview of the social-emotional domains and their content (Phase 1-3) within the context of this study.

Domains	Summary of the content
Domain 1: Handling own body	
Core question	<i>How does the child handle internal (e.g. hunger, fatigue, pain) and external (e.g. noise, touch) sensory experiences?</i>
Phase 1	The child gets overwhelmed by sensory stimuli, and shows agitation or tension, or might shut down as a reaction to these stimuli
Phase 2A	The child begins to show some defense mechanism towards overwhelming stimuli (e.g. covering own ears in case of noise) or can be distracted by others from the stimulus that is bothering him/her
Phase 2B	The child can practice some soothing strategies like taking his/her soother or comforter if necessary or can simply handle a myriad of stimuli
Phase 3	The child is capable of purposefully using his/her body, or parts of it, to reach a goal, like going to the fence to indicate that he/she wants to leave
Domain 2: Dealing with emotionally important others	
Core question	<i>How does the child deal with emotionally important others (e.g., attachment figures, parents, support workers) and how and why is the child looking for contact, both on his/her own initiative and as a reaction to an initiative of the other?</i>
Phase 1	Others are (still) interchangeable as long as the children's basic needs are met. The child may recognize known persons, but shows no preference or differential reaction.
Phase 2A	The child distinguishes between known and unknown persons in a subtle, passive way. This can be by feeling passively more relaxed with known persons or passively more anxious with unknown persons (to be observed by breathing pattern, muscle tension, body posture, ...)
Phase 2B	The child shows active preference signals (e.g. being more enthusiastic, laughing more, looking for proximity ...). The child also differentiates between known persons (a preferred hierarchy is created).
Phase 3	The child is able to seek contact through distance senses (such as calling the parent).
Domain 3: Self-image in interaction with the environment	
Core question	<i>How does the child deal with (changes in) routines, structures and (physical/social) environments?</i>
Phase 1	The child does not notice a change in his/her social or physical environment.
Phase 2A	The child recognizes routines/structures and seems to notice changes in his/her environment, but only in a passive way; for instance by being more at ease in a different environment when important others are present.
Phase 2B	The child actively searches for ways to cope with the stress caused by the change, for instance by protesting or by searching and approaching important others in order to be calmed down. The child might also show some separation anxiety.
Phase 3	The child clearly shows a sense of autonomy or own will.
Domain 4: Person/object permanence	
Core question	<i>How does the child react on objects and persons that appear and disappear out of their sight?</i>
Phase 1	The child does not yet realize that something or someone exists, regardless if they are in or out of sight.
Phase 2A	A notion of object and/or person permanence emerges, as the child displays signs of recognition in case an object or a person appears again.
Phase 2B	The child actively demonstrates some searching behaviors (e.g. peeking under a blanket immediately after the favorite toy has been covered with it, or showing some stress or anxiety when something or someone leaves).
Phase 3	The child expands the search for hidden objects/persons beyond the immediate proximity.
Domain 5: Anxieties	
Core question	<i>In which circumstances does the child experience anxieties?</i>
Not applicable	The child does not show any specific anxieties
Phase 1	The child often experiences displeasure with/anxiety for or can even be 'flooded by' sensory stimuli.
Phase 2A	The child shows some separation anxiety in a limited number of situations,
Phase 2B	The child shows clear and recurrent separation anxiety in different contexts
Phase 3	The child shows some anxiety of losing his/her own autonomy (e.g. by heavily protesting when something is not going according to the own will).
Domain 6: Dealing with peers	
Core question	<i>In which way does the child deal with peers, either on his/her own initiative or as a reaction on an initiative of the other?</i>
Phase 1	The child generally shows no obvious interest in his/her peers.
Phase 2A	The child shows a beginning interest in peers and possibly even differentiates between known and unknown peers.
Phase 2B	The child further differentiates between known peers and shows his/her preferences in a more active manner.
Phase 3	The child begins to actively initiate interaction with peers.
Domain 7: Dealing with materials	
Core question	<i>Does the child show interest in (specific) materials and how does the child handle materials?</i>
Phase 1	The child shows little to no interest in materials, although occasional attention to strong stimuli or movement is possible.
Phase 2A	The child shows a beginning interest in materials and objects with a special characteristic (e.g. bright colors, loud noise, movements, ...) which is mainly expressed by rather passive acts such as focusing on the object, altering body posture, and so on.
Phase 2B	The child expands his/her interest to different types of materials (e.g. also sand, water, grass, ...), shows more active exploration and manipulation of objects and oftentimes, shows behaviors based on immediate action response.

(Continued)

Domains	Summary of the content
Phase 3	The child shows targeted experimentation (e.g. opening and closing things) and a more investigative attitude towards material.
Domain 8: Communication	
Core question	<i>How does the child communicate and is the communication intentional?</i>
Phase 1	Those who know the child well can see whether he/she is (un) comfortable, but the child him-/herself does not intentionally communicate this.
Phase 2A	The child's messages are more differentiated and the child might show some intentional behaviors (like reaching for or pushing something/someone away, but he/she does not communicate this intentionally towards a communication partner
Phase 2B	There is some reciprocity in the child's behaviors and there is an emerging triadic interaction, which involves the child, an object or activity and another person.
Phase 3	The child purposefully uses (conventional) gestures or symbols, in order to achieve a goal (e.g. getting a cookie, or attention).
Domain 9: Emotion differentiation	
Core question	<i>What is the child's (basic or advanced) emotional repertoire?</i>
Phase 1	The child only shows a basal differentiation between distress and satisfaction. Often these expressions of (dis)pleasure can be explained by the fulfillment of their primary needs (such as hunger, thirst or pain).
Phase 2A	The child is beginning to show other basic emotions besides being (dis)content (i.e. being sad, happy or angry). The child does not necessarily differentiate the expression of these emotions towards known or unknown persons.
Phase 2B	The child clearly shows more (varied) emotions in interaction to or in the presence of emotionally significant others.
Phase 3	The child exhibits emotions which are more egocentric in nature, such as being proud or being jealous.
Domain 10: Aggression regulation	
Core question	<i>What causes aggression, how does the child show aggression and can the child control his/her aggression?</i>
Not applicable	The child does not show aggression/frustration.
Phase 1	The child regulates his/her feelings of aggression or frustration in an uncontrolled and self-directed manner (e.g. getting overwhelmed by the frustration of being tired, being hungry or being over-stimulated by their environment, and showing this by being aggressive towards themselves, such as banging their heads).
Phase 2A	The child tries to control the situation by showing aggression towards the environment (e.g., throwing toys from the table).
Phase 2B	The child tries to control the situation by showing aggression towards another person ("calling on another person")
Phase 3	The child orients aggression towards the person who is eliciting the frustration (especially when the children's own will is restricted).
Domain 11: Day activity-play development	
Core question	<i>Which activities does the child like during moments of free play?</i>
Phase 1	When confronted with a free play situation, the child shows sensory play that is primarily focused on themselves with little to no attention for the surrounding material or social context.
Phase 2A	The child shows a more prominent focus on materials, but shows no clear need for interaction within play.
Phase 2B	The child shows a clear need for interaction with others within a play context (e.g. peekaboo).
Phase 3	The child looks for boundaries within play (in line with domain 7).
Domain 12: Moral development	
Core question	<i>Can the child follow rules?</i>
Phase 1	The child has not yet developed a personal conscience, only 'physical retention' will be effective in stopping unwanted behavior.
Phase 2A	A passive recognition of the difference between approval and disapproval is present.
Phase 2B	The child is able to momentarily adjust his/her behaviors based on the reactions from parents.
Phase 3	The child is developing an external conscience and shows more enduring behavioral adjustments.
Domain 13: Emotion regulation	
Core question	<i>How does the child regulate emotions, whether or not in interaction with or with the help of others?</i>
Phase 1	The child's emotion regulation is done by his/her autonomous nervous system, by removing the stressful stimulus or providing the child with soothing bodily experiences (like rocking the child, not for the sake of contact, but for the sensation of rocking).
Phase 2A	The child needs someone else to regulate his/her emotions, but whomever provides comfort, structure or distraction is efficient in doing so.
Phase 2B	The child shows a clear preference towards emotionally significant others when he/she is distressed.
Phase 3	The child has more self-control over his/her emotions.

Note: Detailed scoring guidelines are available on request. The descriptions within this table summarize the adapted scoring guidelines within the context of this study and can therefore differ from the descriptions within the SED-R manual.

was mainly driven by who signed up for the study, the choice of the parents (e.g. when children mainly lived in residential care the parents sometimes preferred to include the professional caregiver) or pragmatic reasons (e.g. who

was able to fit the interview in their time schedule). Preference was given to interviewing the parent(s). The interviews lasted 47 min on average, roughly ranging between 17 and 98 min.

Afterwards, all interviews were transcribed. Four independent researchers got acquainted with the scale's manual by reading and discussing the different social-emotional domains with their core criteria and prototypical examples for each developmental phase. Additional information on the scoring of the instrument provided by the authors of the SED-R (during a one-day training as well as an individual meeting between the researchers and one of the authors) was taken into account. The content of these discussions and the low inter-rater reliability of some pilot ratings indicated that the subdivision of the social-emotional domains in the five broad age-related phases (see Table 1) did not fully capture (all) the developmental differences between children in this specific target group. Therefore, the researchers felt the need to subdivide the second phase in two subphases, indicating that the criteria related to that phase are either 'emerging' (2A) or 'mastered' (2B). In general, the difference between the 'emerging' (2A) and 'mastered' (2B) subphase is the discrepancy between the children's passive (2A) or active (2B) expression of certain behaviors that are indicative for phase 2. For example, in domain 2 (Dealing with emotionally significant others), children will be assigned phase 2A when they passively recognize and prefer their parent compared to a stranger (although their expression is subtle, such as feeling more at ease with the parent, to be observed by e.g. slow breathing, little tension in the muscles, a relaxed body posture...). Children will, on the other hand, be assigned phase 2B when they exhibit active preference signals (such as smiling). More detailed information on the scoring guidelines is to be found in Table 3; the complete scoring guidelines are available upon request. To ensure the reliability of this procedure the first nine interviews were scored by all four independent raters. The other 36 interviews were alternately and randomly assigned to two out of the four independent raters. In case of initial exact agreement (.66 on average, ranging from .53 to .85 for each domain and ranging from .59 to .71 for each combination of raters), scores did not need to be discussed further. In case of non-identical scores, the final scores were obtained through a consensus rating procedure in the presence of all four researchers. Discussion was based on the established scoring guidelines until consensus was reached, in line with the original SED-R manual and procedure.

Data analysis

First, the number of children functioning in each phase of social-emotional development was calculated, both at domain and global level. The global level was estimated using the seven lowest domain scores and was, thus, equal to the median of the domain scores, conform the guidelines of the SED-R (Claes and Verduyn 2012). For example, if the seven domains that scored the

lowest are all situated in phase 1 and phase 2A, it is concluded that the global level of emotional functioning of that particular person will not be higher than phase 2A (although the person might reach a higher domain score on particular domains)⁴. The relation between the children's chronological age and their global level of social-emotional functioning was visualized using a scatterplot and a one-way ANOVA was conducted to statistically evaluate this relationship. Second, the sample was divided according to their global level of functioning. For each group (based on the global level) separately, the number of children functioning at each phase of social-emotional development was calculated again for each domain, allowing to identify domains that developed more rapidly or slower compared to the children's global level of social-emotional functioning.

Results

Global level of social-emotional functioning

An overview of the participants' scores on the SED-R is presented in Table 4. More particular, 36% of the children can be globally situated within the adaptation phase (Phase 1), which indicates these children are oriented towards reaching psycho-physiological homeostasis by learning how to integrate sensory stimuli and the structure of time, place and persons. The first socialization phase, which is primarily characterized by its focus on the formation of a secure emotional base in the context of an attachment bond, is emerging in 44% (Phase 2A) and mastered in 20% (Phase 2B) of the children. None of the 45 children globally reached the third phase, although this could be expected based on their chronological age. In this regard, Figure 1 visualizes the relation between the children's chronological age and their global level of social-emotional functioning, which yielded no significance using one-way ANOVA ($F(2,42) = 1.37$ $p = .26$). As the scatterplot (see Figure 1) indicates, there is a lot of variation within each global level of social-emotional functioning with regard to chronological age. All children functioned at a social-emotional age range below their chronological age. For 12 children this difference was one phase, for 25 children this difference was 2 phases and for 8 children this difference was three phases. Overall, for 15 out of the 45 children, this difference reflected the maximum amount of phases they could theoretically diverge.

⁴In the current research, sometimes not all 13 domains were scored and thus included in data analysis (because of missing information or because the domain was not applicable). In that case, the median of the remaining domains was still used as the global level of functioning. If the amount of domains was even, the lowest phase was chosen.

Table 4. Number of children rated in the different developmental phases for the 13 social-emotional domains and the global social-emotional level.

Social-emotional domain	Phase 1	Phase 2A	Phase 2B	Phase 3	N/A	N/I
1. Handling own body	30 (67%)	8 (18%)	5 (11%)	2 (4%)	/	0
2. Dealing with emotionally important others	9 (20%)	15 (34%)	17 (39%)	3 (7%)	/	1
3. Self-image in interaction with the environment	11 (26%)	20 (47%)	8 (19%)	4 (9%)	/	2
4. Dealing with a changing environment - object permanence	15 (33%)	14 (31%)	12 (27%)	4 (9%)	/	0
5. Anxieties	28 (64%)	1 (2%)	4 (9%)	2 (5%)	9 (20%)	1
6. Dealing with peers	14 (31%)	18 (40%)	10 (22%)	3 (7%)	/	0
7. Dealing with materials	8 (18%)	15 (33%)	20 (44%)	2 (4%)	/	0
8. Communication	16 (36%)	11 (24%)	16 (36%)	2 (4%)	/	0
9. Emotion differentiation	19 (43%)	17 (39%)	5 (11%)	3 (7%)	/	1
10. Aggression regulation	27 (60%)	3 (7%)	1 (2%)	1 (2%)	13 (29%)	0
11. Day activity-play development	16 (36%)	15 (34%)	12 (27%)	1 (2%)	/	1
12. Moral development	25 (61%)	6 (15%)	8 (20%)	2 (5%)	/	4
13. Emotion regulation	14 (32%)	15 (34%)	15 (34%)	0 (0%)	/	1
Global level of social-emotional functioning	16 (36%)	20 (44%)	9 (20%)	0 (0%)	/	/

Note: N/A stands for not applicable (in case primary caregiver(s) reported no clear anxieties or aggressive behavior present in their children), N/I stands for not enough information was available in the interview. Group percentages were calculated excluding the N/I category.

Domain level of social-emotional functioning **Handling own body**

The domain of handling their own body reflects how children cope with both internal and external stimuli. The majority of the children (67%) are still overwhelmed by sensory stimuli, and show agitation or tension, or might shut down as a reaction to these stimuli (phase 1). Another 18% of the children begin to show some defense mechanism towards overwhelming stimuli or can be distracted by others from the stimulus that is bothering them, which is characteristic for phase 2A. A smaller amount of children (11%) practice some soothing strategies like taking their soother or comforter if necessary or can simply handle a myriad of stimuli (phase 2B). Two of the children (4%) are capable of purposefully using their body, or parts of it, to reach a goal, like going to the fence to indicate that you want to leave. That kind of behavior fits within the individuation phase (phase 3).

Dealing with emotionally important others

In the domain of dealing with emotionally important others, which mainly focuses on the development of attachment relationships with significant others, most of the children (73%) are emerging towards or reach phase 2. This implicates that children are socially oriented (especially towards their primary caregiver(s)) and clearly differentiate between known and unknown persons. For 34% of the children, there is only a slight preference for primary caregivers, which is shown in a subtle or passive way. For 39% of the children, active preference signals (such as smiling, seeking contact or proximity) are recognized as well. About one fifth of the children were best characterized by the adaptation phase, which indicates that others are (still) interchangeable as long as the children's basic needs are met. Three children (7%) surpassed phase 2 and were emerging towards phase 3, since they were able to seek

contact through distance senses (such as calling the parent).

Self-image in interaction with the environment

In relation to the domain of self-image in interaction with the environment, a quarter of the children do not notice a change in their social or physical environment, which is typical for the adaption phase. Almost half of the children (44%) seem to notice the change, but only in a passive way (phase 2A), for instance by coming at ease again in the presence of important others when such a change causes any stress. Other children (18%) actively search for ways to cope with this stress, for instance by protesting or by searching and approaching important others in order to be calmed down (phase 2B). These children might also show some separation anxiety. A few children have reached the individuation phase with regard to this domain, and clearly show a sense of autonomy or own will.

Dealing with a changing environment - object permanence

With respect to this domain, the primary question is how the children react on objects and persons that appear and disappear out of their sight. The group is almost equally divided over the first three phases, with a slight dominance of the first phase, in which children do not yet realize that something or someone exists, regardless if they are in or out of sight. In phase 2A, a notion of object and/or person permanence emerges, as the children display signs of recognition in case an object or a person appears again. If the children actively demonstrate some searching behaviors, this is an indication that these children have reached phase 2B for this specific domain. Examples here would be peeking under a blanket immediately after the favorite toy has been covered with it, or showing some stress or anxiety when something or someone leaves. Only if the children also expand the search beyond the immediate

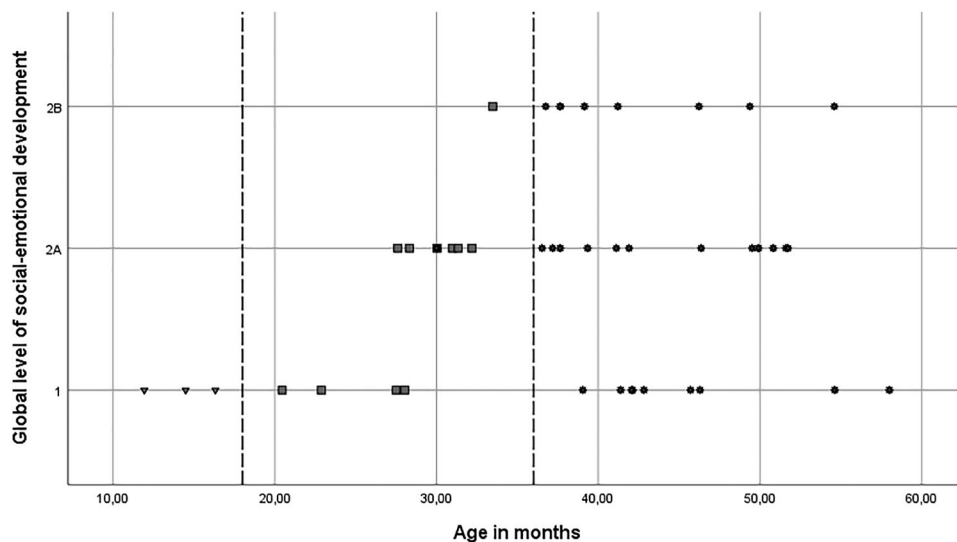


Figure 1. Scatterplot of the age in months and the global level of social-emotional functioning.

Note. Reference lines were placed at 18 months and 36 months, which are the upper age limits for phase 2 and phase 3 in the SED-R

proximity, phase 3 can be assumed. This is the case for three participants.

Anxieties

The phase differentiation in this domain is primarily based on the cause of the anxiety the children experience. In that regard, 64% of the children can be situated within phase 1, indicating they often experience displeasure with/anxiety for or can even be ‘flooded by’ sensory stimuli. Phase 2 is emerging in one child (2%), indicating this child is showing some separation anxiety in a limited number of situations, while four children (9%) show clear and recurrent separation anxiety in different contexts (cf. phase 2B). Further, two children (5%) are situated within phase 3 since they show some anxiety of losing their own autonomy (e.g. by heavily protesting when something is not going according to their own will). In 20% of the group, this domain was scored as ‘not applicable’ because the primary caregivers reported an absence of specific anxieties in the participating children.

Dealing with peers

In this domain, 31% of the children are situated within phase 1, which indicates they generally show no obvious interest in their peers, while 40% of the children show a beginning interest and possibly even differentiate between known and unknown peers (cf. phase 2A). The children who are situated within phase 2B, which is 22% of the group, further differentiate between known peers and show their preferences in a more active manner. Three children (7%) are situated within phase 3, which means they are beginning to actively initiate interaction with their peers.

Dealing with materials

With regard to materials, 18% of the children can be situated in phase 1, which indicates they show little to no interest although occasional attention to strong stimuli or movement is possible (e.g. a child looks at the moving mobile above the nursing pillow). When looking at phase 2A, it is clear that 33% of the children do show a beginning interest in materials and objects with a special characteristic (e.g. bright colors, loud noise, movements, ...) which is mainly expressed by rather passive acts such as focusing on the object, altering body posture, smiling, vocalizing and so on. Further, looking at phase 2B, 44% of the children are reported to expand their interest to different types of materials (e.g. also sand, water, grass, ...), to show more active exploration and manipulation of objects and oftentimes, to show behaviors based on immediate action response. Two children (4%) are situated within phase 3, which means they show targeted experimentation (e.g. opening and closing things) and show a more investigative attitude towards material (‘looking for boundaries’).

Communication

In 36% of the children, those who know the child well can see whether the child is comfortable or rather uncomfortable, but the children themselves do not intentionally communicate this (phase 1). In a quarter of the children, the messages are more differentiated, and the children might show some intentional behaviors, like reaching at something or someone, or pushing something away, but still they do not communicate this intentionally towards a communication partner (phase 2A). However, in 36% of the children, there is some reciprocity in their behaviors, or the presence of a person next to the object is sensed or the other way around. In other words, there is an emerging triadic

interaction, which involves the child, an object or activity and another person (phase 2B). In the third phase, the children purposefully use (conventional) gestures or symbols to really convey a communicative message to another person, in order to achieve a goal like getting a cookie, or some attention. The children then might show some satisfaction when that goal is achieved. Two participants have reached this phase.

Emotion differentiation

With regard to the children's (basic or advanced) emotional repertoire, most of the children (43%) only show a basal differentiation between distress and satisfaction. Often these expressions of (dis)pleasure can be explained by the fulfillment of their primary needs (such as hunger, thirst or pain). A substantial group of children (39%) is, however, emerging towards phase 2, which means that they are beginning to show other basic emotions besides being (dis)content. These basic emotions include being sad, happy or angry. However, for most of the children there is no differentiation between the expression of these emotions towards known or unknown persons (Cf. phase 2A). A smaller group of children clearly shows more of these emotions in interaction to or in the presence of emotionally significant others (11%, phase 2B). Three children exhibit emotions, which are more egocentric in nature, such as being proud or being jealous.

Aggression regulation

More than half of the children (60%) regulate their feelings of aggression or frustration in an uncontrolled and self-directed manner. These children, for example, get overwhelmed by the frustration of being tired, being hungry or being over-stimulated by their environment, and show this by being aggressive towards themselves (such as banging their heads). Three children emerge towards phase 2, because they attempt to control the situation by showing their aggression towards the environment (e.g. throwing their toys from the table). One child also makes an appeal to another person by hitting the person to draw attention (Cf. phase 2B). Another child is situated in phase 3, which indicates that aggression is towards the person who is eliciting the frustration (especially when the children's own will is restricted). There is a substantial group (29%) for whom the respondent indicated that there is no aggression and that, thereby, this category is not applicable.

Day activity/play development

When confronted with a free play situation, 36% of the children show sensory play that is primarily focused on themselves with little to no attention for the surrounding material or social context (cf. phase 1). The 34% of children situated within phase 2A show a more prominent focus on materials than on their own body, but

show no clear need for interaction within their play. However, this latter condition is central within phase 2B, where a clear need for interaction with others within a play context (e.g. peekaboo) is evident in 27% of the children. One child is functioning within phase 3, which indicates a focus on looking for boundaries within play, in line with domain 7 (materials).

Moral development

The majority of the children (61%) function within phase 1, indicating they have not yet developed a personal conscience and only 'physical retention' will be effective in stopping unwanted behavior. In 15% of the children, a passive recognition of the difference between approval and disapproval is present (cf. phase 2A), while 20% of the children are able to momentarily adjust their behaviors based on the reactions from parents (cf. phase 2B). Two children function within phase 3, indicating the development of an external conscience and more enduring behavioral adjustments.

Emotion regulation

The domain of emotion regulation is concerned with the way children regulate their emotions, whether or not in interaction with or with the help of others. For this domain, an almost equal distribution can be noticed between phases 1, 2A and 2B. Almost one third of the group (32%) is situated in phase 1, which reflects that emotion regulation is done by their autonomous nervous system, by removing the stressful stimulus or providing them with soothing body experiences (like rocking the child, not for the sake of contact, but for the sensation of rocking). Another third of the group (34%) is emerging towards phase 2. This indicates that these children need someone else to regulate their emotions, but whomever provides comfort, structure or distraction is efficient in doing so. For another third of the group (34%), it clearly matters who provides comfort; a clear preference towards emotionally significant others is noticeable when the child is distressed. None of the children reached phase 3 in which children have more self-control over their emotions.

The relation between the global and the domain level

On average, children functioned on 2.96 different phases ($SD = 0.80$, $Min = 1$, $Max = 4$) across the different domains (*phase diversity*). More particularly, while one child functioned on a singular phase (phase 1) for all domains, 12 children (27%) showed a phase diversity of two phases and 32 children functioned within three (44%) or four (27%) different phases. Children who's median across domains is phase 1 ($n = 16$) function on average on 2.31 different phases ($SD = 0.70$, $Min = 1$, $Max = 4$). For children who's median is phase 2A ($n = 20$), the phase diversity is slightly higher

Table 5. The amount of children who scored lower than, equal to or higher than the median per social-emotional domain (except for N/A, N/I).

	Lower than the child's median	Equal to the child's median	Higher than the child's median
1. Handling own body	17	21	7
2. Dealing with emotionally important others	2	20	22
3. Self-image in interaction with the environment	3	27	13
4. Dealing with a changing environment - object permanence	4	28	13
5. Anxieties	13	19	3
6. Dealing with peers	7	23	15
7. Dealing with materials	3	19	23
8. Communication	4	29	12
9. Emotion differentiation	10	27	7
10. Aggression regulation	14	17	1
11. Day activity-play development	6	28	10
12. Moral development	15	18	8
13. Emotion regulation	3	30	11

($M = 3.15$, $SD = 0.84$, $Min = 2$, $Max = 4$). The phase diversity is the highest for children who's median across different domains is phase 2B ($M = 3.57$, $SD = 0.71$, $Min = 2$, $Max = 4$). The amount of domains for which the children's scores deviate from the children's median across domains is on average 5.47 domains out of 13 domains ($SD = 2.55$, $Min = 0$, $Max = 10$). An overview of the amount of children whose score for a particular domain is lower than, equal to or higher than the child's median, is given in Table 5.

Based on visual inspection of Table 5, specific domains that were often scored higher than the children's global level of functioning were domain 2 (*Dealing with emotionally important others*) and domain 7 (*Dealing with materials*). On the contrary, domains that were often scored lower than the children's global level of functioning were domain 1 (*Handling own body*), domain 5 (*Anxieties*), domain 10 (*Aggression Regulation*) and domain 12 (*Moral Development*). This was supported by the findings in Table 4, where less than a quarter of the children functioned in Phase 1 for the former domains (2 and 7), but more than half of the children functioned in Phase 1 for the latter domains (1, 5, 10 and 12).

Discussion

Conclusions

The current study examined the social-emotional functioning, both globally and per domain, of young children (12-58 months) with a significant cognitive and motor developmental delay, using an adapted scoring system of the Scale for Emotional Development - Revised (SED-R). Concerning the global level of social-emotional functioning, all children in the current sample functioned within the adaptation phase (*Phase I*; which corresponds to 0-6 months) or were developing towards or functioning within the first socialization

phase (*Phase 2*; which corresponds to 6-18 months). None of the children globally reached the individuation phase (*Phase 3*, which corresponds to 18-36 months). At an individual level, each child showed a delayed social-emotional development in relation to his/her chronological age.

Though from a global perspective a significant delay in social-emotional development was noticeable, the current study also explored the functioning of children with SDD per domain to get a more nuanced image of their social-emotional functioning. Knowing if and which domains generally develop faster or slower within this target group, can provide insights to better meet their basic emotional needs. This study showed that the included children tend to function within several different phases across social-emotional domains. Partly, this can be interpreted as normal variation within a child's growth process. However, even though no strict guidelines are available to consider a child's social-emotional profile as 'disharmonious', a phase diversity of more than two phases is cautiously described as such within the SED-R manual. Since this is the case for the vast majority of the children in the current sample and a 'more disharmonious' profile of the child can have important consequences for the child's support (i.e. parents and support workers need to pay explicit attention to the specific domains that deviate from the child's global level of social-emotional functioning and adjust their approach accordingly), this is a very important result. Further, it was often seen in the current study that, although children did already reach higher phases with regard to having a preference for someone or exploring materials, other elements of social-emotional development were (still) absent (e.g. the parents did not notice any aggression or fear) or (still) present (e.g. the child still got overwhelmed by sensory stimuli). With regard to moral development, most informants indicated that the child is unaware of

his/her engagement in unwanted/socially inadequate behavior. In line with this finding, Van keer *et al.* (2017) reported that parents showed little disciplinary parenting behaviors, based on the conviction that a punishment will not have an impact on their children's behavior or that it is not necessary due to a lack of unwanted behaviors.

Strengths, limitations and recommendations for future research

In this study, a rigorous characterization of the social-emotional functioning within an understudied population was achieved by applying an existing interview procedure and adapting the analysis to the specific target group. Careful negotiation between different raters, combining an independent rating with a consensus rating procedure, was indispensable to get reliable codes. The added value of the subdivision of phase 2 was confirmed by the fact that for each domain, a sheer amount of children could be rated in both subphases. This indicates that for the children in our target group a more disaggregated scoring seems valuable for getting a more 'honest' estimation of their level of emotional development, also setting the stage for a correct evaluation of changes in functioning which might otherwise be obscured. However, it is important to note that the phase definitions and order within the (adapted) SED-R are based on a 'typical' developmental trajectory, while it is certainly possible that the developmental trajectory of children with SDD cannot only be characterized as delayed, but also as different (Visser *et al.* 2017). Conducting longitudinal research to chart the (possible differences in) developmental trajectories as well as studies applying a more bottom-up approach to identify even smaller subphases within these children's functioning are warranted. Also the concept of 'phases' itself can be critically analyzed, since during the analysis children sometimes appeared to show indicators of multiple (even non-adjacent) phases. Although challenging due to measurement issues in this specific target group, it would have been very interesting to not only compare these children's level of social-emotional functioning with their chronological age, but also with their cognitive developmental age. This would uncover possible discrepant profiles, which are often mentioned and observed in clinical practice and are relevant to understand and deal with problem behavior that could arise from this discrepancy (Došen 1990, 2005). Further, the interrelatedness of the different domains within the SED-R and especially the prominent role of attachment within the development of social-emotional skills could be explored within the specific target group. To conclude, it should be noted that the non-randomized sampling method impedes the generalizability of this study's results and in this regard, our insight into a

possible selection bias is limited due to the dependence on professionals in the recruitment of the participants.

Implications for practice

The results of this study confirm that the SED-R can be used as a reflection tool that enables parents and professionals to assess the basic social and emotional needs of children with SDD. However, typically developing children slip as it were for the different domains from phase to phase, while children with significant delays might linger in one or more domains. Therefore, the global score of the SED-R in itself should be interpreted with caution, since the development of children with SDD may pass disharmoniously. A better understanding of the presence or absence of specific developmental milestones, may help parents and professional caregivers to design interventions and learning environments which play to the strengths of their children while accommodating their weaknesses (Ames and Fletcher-Watson 2010). Moreover, by taking the specific strengths and weaknesses of the individual children into consideration, parents and professionals might anticipate on the occurrence of challenging behavior and perhaps even future mental health problems (Poppes *et al.* 2010, Janssen *et al.* 2002).

Acknowledgements

We would like to thank all participating families for their time, effort and enthusiasm. Also, we are immensely grateful to Gertruud Schalen, Kristien Hermans, Lien Vanderkerken, Minou Nauta, Riëtte Krijgsheld and Stephy Colla for their contribution to the broader project in which this study is embedded. This work was supported by the Research Foundation Flanders (Fonds voor Wetenschappelijk Onderzoek Vlaanderen).

Disclosure statement

No potential conflict of interest was reported by the authors.

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